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AUTHOR Banks, Ellen
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ABSTRACT

An investigation was made of children's factual knowledge of health-related concepts and the cognitive implications of their answers to questionnaire items such as "What makes a person sick?", "What is medicine?", and "Do you know what a germ is?" Participants were 80 healthy children between approximately 3 and 15 years of age. An additional 61 children were asked to draw pictures of germs. Results indicate that developmental changes in concepts of health and sickness as expressed in the interviews and drawings are basically consistent with developments reported in other studies of health-related concepts. Children above preschool age tended to be less egocentric and magical in accounts of illness and to use standard medical and cultural explanations of colds, germs, and illness. Results neither affirm nor deny that operational logic is found in children's thinking about health and illness, but suggest that more intensive interviews presenting situations of complex, contrasting variables would be necessary before these forms of logic could be identified. The present study does support previous research in finding that younger children tend to have external, egocentric ideas about illness and that concepts of illness as internal processes come later. (RH)

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Concepts of Health and Sickness of Preschool and School Aged Children

Ellen Banks

Daemen College

Amherst, New York*

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Health and sickness, how colds happen, how people get well, what germs are, how medicine works, hospitals, and dental health were among the topics of interviews in this study of children from 3 to 15 years of age. Several previous studies of children's concepts of health and illness have described age differences in these concepts in terms of Piagetian stages. Bibace and Walsh (1980) identified prelogical, concrete logical and formal logical concepts of colds, heart attacks and other conditions. They found that younger children were mostly aware of external aspects of illness while older children described illness as an internal process. Simenonsson, Buckley and Monson (1979) reported a trend, among hospitalized children, from attributing illness to magical causes or global processes, to attributing it to rule-breaking. These authors postulated a third stage, of scientific principled reasoning, but found it rarely occurred in their study group of group of children up to 9 years old. Studies of health concepts tend to involve either hospitalized children or children who are not ill, rather than contrasting both groups in one study. Comparing both kinds of research, Brodie (1974) suggests that children who are ill are more likely to identify illness with doing something wrong than are healthy children. Natapoff (1978) found that positive concepts of health, as opposed to descriptions of health as lack of illness, were prevalent among 1st, 4th and 7th grade children. A cognitive developmental trend was found in this study, in that only the oldest children were likely to say that a person could be part sick and part healthy at the same time. Another cognitive aspect

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of health and illness concepts, beyond factual knowledge, was identified by Neuhauser, Amsterdam, Hines and Steward (1978), who reported that children's explanations of visible, external conditions such as cuts were more logical than their statements about internal conditions such as illness. Few children could describe the process of recovery from illness, but they were fairly accurate in describing the healing of cuts. The present study continues the trend of research in this area by inquiring about children's factual knowledge of health related concepts and also exploring the cognitive implications of their statements.

Method

A questionnaire on topics related to health and illness was developed through pilot testing on 10 children representing the age range of the study. (A copy of the questionnaire is available from the author). The questionnaire was used in a flexible, open-ended interview. All children were interviewed individually by the author or by students. The interviews were conducted at schools, using separate rooms or a quiet screened corner of one classroom, or in the children's homes. Children were interviewed with the permission of their parents, and were not required to participate.

Items that are discussed in this paper include, "What makes a person sick?" "What is medicine?" "What is a cold?" "Why do people cough when they get a cold?" "Do you know what a germ is?" and "What is a cavity? What makes cavities?" These questions were asked in the order listed. Other questions, used between and after those above, concerned hospitals, operations, nutrition and growth.

A different set of children was asked to draw pictures of germs. These pictures were collected with the parents' and childrens' consent during various other developmental psychology studies and observations, in most cases by undergraduate students.

Subjects

Interviews were carried out with 80 children at a college-sponsored nursery school, a rural elementary school, and at children's homes in various towns and cities in New York State. Ages were: 3 to 5 years, 22 children; 6-8 years, 37; 9 to 11 years 14;and 12 to 15 years, 6 participants. None of the children had major health problems or physical handicaps.

Pictures were collected from 61 children, 38 from age 3 to 5 years, 18 from 6 to 10 years, and 4 from 11 to 14 years.

Results

To the first question,"What makes a person sick," pre-school children most frequently gave answers involving cold weather or going out with insufficient clothing. 37% of 3-5 year olds gave this kind of answer, which remained popular with other age groups at 30%, 25% and 20% of 6-8, 9-11 and 12+ year olds, respectively. (See Table 1). (Percentages are reported for any answers that came within the categories mentioned. Some answers were not classifiable, and some children gave more than one answer to a question, which was then coded into all applicable categories.) Answers involving contagion, such as "You get sick from other people who are sick," and answers mentioning "germs" increased in the 6-8 and older groups, with "germs" as the predominant answer for children above 9 years (37% at 9-11 and 60% at 12+.) Eating the wrong food was regarded as a cause of illness by 6% of the 3-5 year olds, 10% of the 6 to 8 year olds, 25% of the 9 to 11 year olds and 20% of those over 12 years. Unusual answers such as "spiders" "ghosts" and "smoke" occurred as 25% of answers at 3 to 5

years and 5% and 25% at 6-8 and 9-11 years. Comparing the categories above plus "don't know," a Chi-Square test of categories by age groups was not significant.

"What is a cold" was answered "don't know" or given no answer by 60% of children of 3 to 5 years, and only one older child (see Table 2) while a cold was simply identified as being "sick" by 27% of answers in the 3-8 year groups (combining two age categories in the table) and only one child over 9 years. Among children 6-8 and 9-11 years, colds were typically identified by symptoms (43% at 6-8 and 82% at 9 to 11) while "germs" were part of the answers of one or two children in each age group. Several 6 to 8 year olds described colds in terms of the social consequences, such as missing school, for example, "You get awfully sick and you feel terrible. People feel sorry for you and treat you nice." Age differences in answers to this question were significant at the $p<.05$ level on a Chi-Square test.

"Why do people cough when they have a cold?" turned out, as expected, to be a difficult question, with no significant age trend and many uncategorizable answers. (Table 3). Children tended to answer "don't know" or to give tautological answers: "they wouldn't have a cold if they didn't cough." A few children said that coughing gets rid of germs. The most unusual answer to this question was "Because they've got a cord in their body that comes up and tickles their throat. The cord breaks up into mushy stuff that you spit out." (age 10). An 11 year old said, "Because when you get sick, the mucous membrane gets in the throat. The cough forces it out."

"What is a germ?" showed a significant age trend (Table 4) with most 3 to 5 year olds answering "don't know" while 21% of that age group said a germ is "bad." Germs were identified with disease by 72% of children over 5 years. Because this question

evoked some of the most imaginative responses, several answers are listed in Appendix 1.

"What is medicine" met with a general response such as "makes you better" in 75% of 3-5 year olds' answers, and 53% at 6-8. Medicine was described in descriptive, sensory or social terms by many 9 to 11 year olds: "pills and stuff","the doctor gives it to you", "cough syrup". Attempts to describe medicine as something special or "scientific" were seen in the use of words like "substance", "formula" and "ingredients" among several children at each age above 6. Some examples are listed in Appendix 1. The categorizable answers to this question are displayed in Table 5; age differences were significant at the $p<.05$ level.

Questions about teeth and cavities were included in 28 of the interviews. No children answered "don't know" to this question, but answers were quite diverse. Among the responses heard from more than one child, cavities tended to be identified as holes in the teeth by younger children and as decay by older children, but the numbers of responses were considered insufficient for statistical analysis. Toothpaste commercials and other sources of dental education seemed to be partially absorbed by children who linked cavities to food stuck to the teeth. Only two children, ages 6 and 11, connected dental cavities to germs.

Results--Drawings

Among 21 children of 3 and 4 years who were asked to draw pictures of germs, 3 produced drawings with identifiable faces, 3 drew circular shapes with scattered inner areas, and 15 drawings were undifferentiated circular formed or linear scribbles. Generally these drawings appeared characteristic of drawings at the pre-school level with no features particularly related to the topic. Among 18 5 year olds , 3 drew faces, 1, a pattern of little shapes, 3 drawings were classified as unidentifiable shapes, and 11

looked like drawings of people, with heads and bodies. Of these, 8 had angry, sad or menacing facial expressions, while 3 had smiling faces. One of these drawings, by a child who declared that she knew about this because her mother is a nurse, showed a person with an orange, spotted substance coming from her mouth. The kindergarteners, then, tended to depict germs as something negative. Among the 18 drawings by children 6 to 10 years, 5 were approximately human like shapes that were angry or menacing. One child depicted a circle, holding hands, of alternating sad, round characters and green globs labelled "flem". Another drew three figures of varying happy and sad expressions. One child drew a wrist and hand, and the remainder produced abstract shapes: oblong wavy shapes, a circle surrounded by spikes, a tiny dot and a large, black circle with the caption "supposed to be the size of a dust." Of four drawings by children over 10 years, two included captions indicating that the germ was actually very small. One drew a pattern of multicolored vein-like tubes. Only one of the drawings at any age was specifically identified as a bacterium or virus. "A common cold germ. One of over 100,000 type of such bacteria," wrote a 12 year old. The progress over the age range in depicting germs seems to indicate increasing awareness that a living thing, too small to be seen normally, can take many physical forms but does not resemble a human. In the interview study, a few children identified germs as animals but none identified them with plants. Some sample drawings are shown in Appendix 2.

Discussion

Developmental changes in concepts of health and sickness as expressed in these interviews and drawings are basically consistent with developments reported in other studies of health related concepts. Previous studies have often applied a Piagetian framework to age changes in these concepts (Bibace and Walsh, 1980, Brodie, 1974, Simeonsson, Buckley and Monson, 1979, Neuhauser, Amsterdam, Hines and Steward,

1978). The present study shows tendencies for children above pre-school age to be less egocentric and magical in accounts of illness and to move toward standard medical and cultural explanations of colds, germs, and illness in general. To identify these changes as "concrete operational" and "formal operational," however, as some authors do, would seem to require that a child demonstrate active logical transformations of concepts. The nature of the topic makes operational thinking difficult to demonstrate. Rarely, in the case of illness, even simple and common conditions like colds, can a set of conditions be systematically varied in any way comparable to dimensions in a conservation or class inclusion problem. Judging from the number of adults who think colds are caused directly by getting one's feet wet , it seems unlikely that real operational thinking, either concrete or formal, is usually applied to questions of illness by children or adults. Some previous studies seem to equate different types of responses about illness as concrete operational or formal operational either because of the ages of the children involved, who are assumed to be in these stages, or because the children have demonstrated operational logic on a standard Piagetian task. The present study does not affirm or deny that operational logic is found in children's thinking about health and illness, but suggests that more intensive interviews presenting situations of complex, contrasting variables, would be necessary before these forms of logic could be identified. In his most closely related work, Piaget (1967) does not apply operational categories to ideas about natural phenomena such as dreams and clouds. The present study does support previous research in finding that younger children tend to have external, egocentric ideas about illness and that concepts of illness as internal processes come later. The author agrees with previous researchers (Bibace and Walsh,1980; Neuhauser,Amsterdam, Hines and Steward, 1978) that health education of both healthy children and children facing illness or surgery should take these developmental differences into account. A question left unsolved by this and previous studies is, if children attribute colds to their own actions, are they likely to feel

blameworthy when more serious illnesses or accidents occur? Research involving both healthy children and those with illness, using the same questions and methods, would be required to begin to answer this question.

Table 1

What Makes a Person Sick?

Age	Cold,Clothes	Contagion	Germs	Wrong Food	Don't Know	Unusual	Total
3-5	37	0	12	6	19	25	99
6-8	30	20	15	10	10	5	100
9-11	20	10	35	20	0	15	100
12+	20	20	60	20	0	0	100

Results are shown as percentages of codeable answers.

Chi Square on raw data (not percentages)=19.00,ns.

Table 2

What is a Cold?

	D.K./No ans	Sick	Symptoms	Germs	Social effects	Total
Age3-5	60	20	20	0	0	100
6-8	4	30	43	9	13	99
9-11	0	9	82	9	0	100
12+	0	0	67	33	0	100

Results are shown as percentages of codeable answers.

Chi Square on raw data (not percentages) 28.24, df=15, $p<.05$

Table 3

Why Do People Cough When They Have a Cold?

Age	Dk. no ans.	Tautol.	Symptoms	Stops cold	Total
3-5	45	27	18	9	99
6-8	50	23	18	9	100
9-11	37.5	12.5	37.5	12.5	100
12+	0	0	50	50	100

Results are shown as percentages of codeable answers

Chi-Square on Raw Data (not Percentages), 6.08, df-9, n.s.

Table 4

What is a Germ?

Age	Don't know	Bad	Dirt	Disease	Total
3-5	63	21	10	5	99
6-8	8	0	8	83	99
9-11	20	20	0	60	100
12+	0	25	12	62	99

Results are shown as percentages of codeable answers

Chi Square on raw data (not percentages), 26.07, df-9, p<.01

Table 5

What is Medicine?

Age	Makes you better	Descriptive	"Scientific"	Total
3-5	75	25	0	100
6-8	53	34	12	99
9-11	9	72	18	99
12+	50	40	10	100

Results are shown as percentages of codeable answers

Chi Square on Raw Data (not percentages), 12.36, df=6, ns

($p<.05 = 12.6$)

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Appendix 1. Selected Responses

The number preceding the response indicates the child's age.

What makes a person sick?

3--A spider or smoke

8--Germs. We get them by touching mud then putting our hands in our mouth or handling food without washing first.

9-Micros. They are like little animals that fly around and then go into a person and make them sick.

9-When you eat something bad and it turns into white blood cells.

12-Tired cells don't work as well.

What is a cold? Why do people cough when they have a cold? What does it mean when you catch a cold?

5--Cough/frogs/catch it from somebody else.

4--You stay in bed because you're sick and you eat chicken soup and watch TV in bed.

8--A disease, a cold germ that comes into the body and eats cells. Cold germs survive mostly in cold weather.

11--A cold is when you're sick with a headache and don't feel good. People cough because something they drink goes down their windpipe.

13--(b) chest congestion. It's the part of the cold that is cured by cough medicine.To catch a cold means that you start getting the symptoms of a cold. It means you're sick or you have a bug or virus.

Do you know what a germ is?

4--There are good germs and bad germs.

5--Germ is bad.

6--A little bug; if you catch one it makes you sick.

8--Germs are dried things that come from the air. They are bacteria. They are fuzzy things that come from plants.

8--A germ is a little squirmy thing that looks like a worm.

9--A long stick, but shorter than a stick, that goes into your body and tries to get you sick.

10--A germ is something you catch by going by a sick person who coughs on you.

11--It's a microscopic bacteria that makes you sick.

What is medicine?

4--Something that makes the nasty things that make you sick go away.

4--Yucky stuff that makes you feel all better later.

6--Medicine is medicine--What do you mean?

11--Medicine is a substance made from natural things such as herbs. It can come in a bottle as a liquid, pill or spray.

13--Medicine is various drugs or prescriptions that are not harmful but help a sick person get better. Medicine is the relief from pain that helps you get better and healthy again.

What is a cavity?

6--Plaque. Some guy who chews at your teeth. This guy is real small and you have to brush him out and rinse him out.

8--It's a brown tooth with food still in it. Candy, gum and not brushing makes cavities.

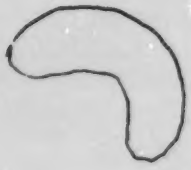
10--A cavity is when someone's tooth hurts. (Cause?) The cavity creeps. Little people who go around digging holes in teeth. You get rid of them by putting toothpaste on them.

11- When a tooth is decayed, turns black and if you don't get it removed it can cause your teeth to turn bad.

Appendix 2. Sample Drawings

3 years

9 years



Actual Size ↓

11 years

Common cold germ, one of over 100,000 types of such bacteria

12 years

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